

**We Claim:**

1. A process for obtaining an acceptable image with an image reader, comprising:
  - a) acquiring an initial image at a given frame rate of the image reader;
  - b) determining whether a signal level of the acquired image is in an acceptable range, and wherein, if not,
  - c) calculating a new frame rate;
  - d) acquiring an image at the new frame rate; and
  - e) decoding the image.
2. The process of claim 1, further comprising:  
acquiring the initial image at least one of a given exposure time and signal gain; and  
determining at least one of a new exposure time and signal gain.
3. The process of claim 1, wherein the new frame rate is either a faster frame rate or a slower frame rate than the initial frame rate.
4. The process of claim 1, wherein the new frame rate is a maximum frame rate.
5. A process for obtaining an acceptable image at a maximum frame rate of an image reader, comprising:
  - a) acquiring an initial image at a given frame rate and an exposure setting with the image reader;
  - b) determining whether a signal level of the acquired image is in an acceptable range, and wherein, if not;
  - c) calculating an exposure time sufficient to obtain an acceptable image;
  - d) determining a highest frame rate that will support the calculated exposure time;
  - e) calculating a new exposure setting that, at the highest frame rate, supports the exposure time; and
  - f) decoding the acceptable image.

6. An algorithm for use by a digital image reader/decoder, comprising the steps:

- (i) acquire an image at an initial frame rate parameter, gain parameter, and exposure time parameter,
- (ii) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if not,
- (iv) calculate a new exposure time parameter to provide a desired image illumination,
- (v) calculate a maximum frame rate parameter that will support the new exposure time,
- (vi) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,
- (vii) determine whether the image is acceptable and, if yes,
- (viii) output and decode the image, and provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (ix) return to (i).

7. An algorithm for use by a digital image reader/decoder, comprising the steps:

- (i) acquire the image,
- (ii) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if not,
- (iv) calculate a new exposure time parameter to provide a desired image illumination,
- (v) calculate a maximum frame rate parameter that will support the new exposure time,
- (vi) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,
- (vii) determine whether the image is acceptable and, if not,
- (viii) provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (ix) return to (i).

8. An algorithm for use by a digital image reader/decoder, comprising the steps:

- (i) acquire the image,

- (ii) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if yes,
- (iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting and, if no,
- (v) calculate a new exposure parameter and a new gain parameter that are, at most, maximum respective values for the initial frame rate, which produce a desired image illumination,
- (vi) determine whether the image is acceptable and, if not,
- (vii) provide the parameters in (iv-v1) to the imager as new initial parameters, and
- (viii) return to (i).

9. An algorithm for use by a digital image reader/decoder, comprising the steps:

- (i) acquire the image,
- (ii) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if yes,
- (iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting and, if no,
- (v) calculate a new exposure parameter and a new gain parameter that are, at most, maximum respective values for the initial frame rate, which produce a desired image illumination,
- (vi) determine whether the image is acceptable and, if yes,
- (vii) output and decode the image, and provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (ix) return to (i).

10. An algorithm for use by a digital image reader/decoder, comprising the steps:

- (i) acquire the image,
- (i) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if yes,
- (iv) determine an illumination level of the image and whether the image was acquired

at a maximum exposure setting and a maximum gain setting and, if yes,

(v) calculate a new exposure time parameter that will provide a desired image illumination,

(vi) calculate a maximum frame rate parameter that will support the new exposure time parameter,

(vii) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,

(viii) determine whether the image is acceptable and, if yes,

(ix) output and decode the image, and provide the parameters in (v-vii) to the imager as new initial parameters, and

(x) return to (i).

11. An algorithm for use by a digital image reader/decoder, comprising the steps:

(i) acquire the image,

(ii) evaluate the image,

(iii) determine whether the system is operating at a fastest frame rate, and, if yes,

(iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting and, if yes,

(v) calculate a new exposure time parameter that will provide a desired image illumination,

(vi) calculate a maximum frame rate parameter that will support the new exposure time parameter,

(vii) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,

(viii) determine whether the image is acceptable and, if yes,

(ix) output and decode the image, and provide the parameters in (v-vii) to the imager as new initial parameters, and

(x) return to (i).

12. A digital image reading system, comprising:

- a) an image sensing component adapted to acquire an image at an initial frame rate parameter, gain parameter, and exposure time parameter; and
- b) a computer coupled to the image sensing component,

wherein the computer is programmed to adjust the frame rate such that the image sensing component can operate at a maximum frame rate to capture an acceptable image.

13. The digital image reading system of claim 12, comprising a one-dimensional image sensor.

14. The digital image reading system of claim 12, comprising a two-dimensional image sensor.

15. The digital image reading system of claim 12, wherein digital image reading system comprises a hand-held reader device.

16. The digital image reading system of claim 12, wherein the image is a 1D dataform symbology.

17. The digital image reading system of claim 12, wherein the image is a 2D dataform symbology.

18. The digital image reading system of claim 12, wherein the computer is programmed with an instruction to:

- (i) acquire the image,
- (ii) evaluate the image
- (iii) determine whether the system is operating at a fastest frame rate, and, if not,
- (iv) calculate a new exposure time parameter to provide a desired image illumination,
- (v) calculate a maximum frame rate parameter that will support the new exposure time,
- (vi) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,

- (vii) determine whether the image is acceptable and, if yes,
- (viii) output and decode the image, and provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (ix) return to (i).

19. The digital image reading system of claim 12, wherein the computer is programmed with an instruction to:

- (i) acquire the image,
- (ii) evaluate the image
- (iii) determine whether the system is operating at a fastest frame rate, and, if not,
- (iv) calculate a new exposure time parameter to provide a desired image illumination,
- (v) calculate a maximum frame rate parameter that will support the new exposure time,
- (vi) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,
- (vii) determine whether the image is acceptable, and if not,
- (viii) provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (ix) return to (i).

20. The digital image reading system of claim 12, wherein the computer is programmed with an instruction to:

- (i) acquire the image,
- (ii) evaluate the image
- (iii) determine whether the system is operating at a fastest frame rate, and, if yes,
- (iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting, and, if no,
- (v) calculate a new exposure parameter and a new gain parameter that are, at most, maximum respective values for the initial frame rate, which produce a desired image illumination,
- (vi) determine whether the image is acceptable and, if not,

- (vii) provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (viii) return to (i).

21. The digital image reading system of claim 12, wherein the computer is programmed with an instruction to:

- (i) acquire the image,
- (ii) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if yes,
- (iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting, and, if no,
- (v) calculate a new exposure parameter and a new gain parameter that are, at most, maximum respective values for the initial frame rate, which produce a desired image illumination,
- (vi) determine whether the image is acceptable and, if yes,
- (vii) output and decode the image, and provide the parameters in (iv-vi) to the imager as new initial parameters, and
- (viii) return to (i).

22. The digital image reading system of claim 12, wherein the computer is programmed with an instruction to:

- (i) acquire the image,
- (ii) evaluate the image,
- (iii) determine whether the system is operating at a fastest frame rate, and, if yes,
- (iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting, and, if yes,
- (v) calculate a new exposure time parameter that will provide a desired image illumination,
- (vi) calculate a maximum frame rate parameter that will support the new exposure time parameter,
- (vii) calculate a new exposure setting parameter that will support the new exposure

time at the maximum frame rate,

(viii) determine whether the image is acceptable and, if yes,

(ix) output and decode the image, and provide the parameters in (v-vii) to the imager as new initial parameters, and

(x) return to (i).

23. The digital image reading system of claim 12, wherein the computer is programmed with an instruction to:

(i) acquire the image,

(ii) evaluate the image,

(iii) determine whether the system is operating at a fastest frame rate, and, if yes,

(iv) determine an illumination level of the image and whether the image was acquired at a maximum exposure setting and a maximum gain setting, and, if yes,

(v) calculate a new exposure time parameter that will provide a desired image illumination,

(vi) calculate a maximum frame rate parameter that will support the new exposure time parameter,

(vii) calculate a new exposure setting parameter that will support the new exposure time at the maximum frame rate,

(viii) determine whether the image is acceptable and, if yes,

(ix) output and decode the image, and provide the parameters in (v-vii) to the imager as new initial parameters, and

(x) return to (i).

24. The digital image reading system of claim 12, wherein the computer comprises a microprocessor.

25. The digital image reading system of claim 12, wherein the computer comprises a programmable gate array.



26. The digital image reading system of claim 12, wherein the image sensing component comprises a CMOS detector.

27. The digital image reading system of claim 26, wherein the image sensing component comprises a rolling shutter.

28. The digital image reading system of claim 12, wherein the computer comprises an exposure control component that controls the exposure in an exposure register.

29. The digital image reading system of claim 12, wherein the image sensing component comprises a solid state imaging device.

30. A digital image reading system, comprising:

- a) an image reading component including a digitizer; and
- b) an image decoding component,

wherein the image reading component includes a plurality of separate digitizers.

31. The digital image reading system of claim 30, wherein the plurality of digitizers are hardware-based digitizers.

32. The digital image reading system of claim 30, wherein the plurality of digitizers are software-based digitizers.

33. The digital image reading system of claim 30, wherein the plurality of digitizers are hybrid hardware/software-based digitizers.

34. The digital image reading system of claim 30, wherein each of the plurality of digitizers is configured to operate over a respective parameter range of a given parameter associated with the plurality of digitizers, further wherein each parameter range is different from any other parameter range.

35. The digital image reading system of claim 34, wherein the given parameter is a reading distance.

36. The digital image reading system of claim 34, wherein the given parameter is a symbology black/white contrast indicia.

37. The digital image reading system of claim 34, wherein the given parameter is a symbology color contrast indicia.

38. The digital image reading system of claim 34, wherein the given parameter is a motion blur indicia.

39. The digital image reading system of claim 34, wherein the given parameter is a bar growth indicia.

40. The digital image reading system of claim 35, comprising three digitizers configured to operate over a close reading range, a medium reading range, and a far reading range.

41. The digital image reading system of claim 34, wherein at least two of the parameter ranges overlap.

42. The digital image reading system of claim 30, wherein at least some of the plurality of digitizers are configured to run in parallel during a single image capture period.

43. The digital image reading system of claim 30, wherein each of the plurality of digitizers is configured to run sequentially during a single image capture period.

44. The digital image reading system of claim 30, wherein each of the plurality of digitizers is configured to run sequentially during a plurality of respective image capture

periods.

45. The digital image reading system of claim 30, wherein the image reading component is a hand-held reader including a solid state image sensor.

46. A process for obtaining an acceptable image, comprising:  
providing a digital image reader having an integrated plurality of digitizers;  
making an image acquisition attempt utilizing one of the plurality of digitizers; and  
making a subsequent image acquisition attempt utilizing a different one of the plurality of digitizers.

47. The process of claim 46, wherein the plurality of digitizers are configured for operation over a respective parameter range of a given parameter associated with the plurality of digitizers, further wherein each parameter range is different from any other parameter range.